

Assessment of Climate Change Knowledge and Attitude among Secondary School Teachers' in Enugu State

Ugwu, N. F. ⁽¹⁾ Familoni, J. K. ⁽²⁾ Anibueze, A. U. ⁽³⁾ Onyekwere, O. K. ⁽⁴⁾ Ajewole, P. I. ⁽⁵⁾
Nwogu, O. F. ⁽⁶⁾ Ibeneme, C. B. ⁽⁷⁾

Department of Human Kinetics and Health Education, Federal University, Oye-Ekiti, Ekiti State, Nigeria ^(1&2) Department of Guidance and Counseling, Federal University, Oye-Ekiti, Ekiti State, Nigeria ⁽³⁾ Department of Physical and Health Education, Federal College of Education, Eha-Amufu, Enugu State, Nigeria ^(4, 6 & 7) Department of Educational Management and Business Studies, Federal University, Oye-Ekiti, Ekiti State, Nigeria ⁽⁵⁾

Email:

Keywords:

Secondary School;
Teachers;
Climate Change,
Knowledge;
Attitude.

Abstract

As opinion leaders and change agents, understanding if teachers possess adequate knowledge of and positive attitude towards the climate change is crucial. This research assessed the climate change knowledge and attitude among secondary school teachers in Enugu State. The study adopted the descriptive survey research design. From the population of 8,909 secondary school teachers in Enugu State, a sample of 384 teachers was drawn for the study through multi-stage sampling procedure. Teachers' Climate Change Knowledge and Attitude Questionnaire was the instrument used for data collection. Split half method was used to determine the reliability of the instrument, using Spearman Brown Correction Formula for climate change knowledge scale which yielded reliability of .72; and Cronbach's Alpha for climate change attitude scale which yielded reliability of .76; Frequency, percentage, mean and standard deviation were used for answering research questions while Chi-square and t-test were used to test the null hypotheses at .05 level of significance. Results show that teachers possessed moderate knowledge of climate change (50.3%) and negative attitude towards climate change ($\text{Grand} = 2.06 < 2.5$, $\text{SD} = 0.96$). There was significant difference in the proportion of teachers who possessed correct knowledge of climate change based on gender and location. There was a significant difference in the teachers' attitude to climate change based on gender ($p < 0.05$) but the difference was not significant based on location ($p > 0.05$). It was recommended for government to set up capacity building programmes for enhancing teachers' climate change knowledge and attitude.

Introduction

With climate change (CC), this century and beyond seems to be faced with the most complex and gravest of the environmental health challenges. The rising global temperature, the new patterns of precipitation, extreme weather events, melting of glacier, rising of sea level, inter alia are unusual

natural occurrences that come with CC (Aaron & McCright, 2010; Adebola, 2010; Committee on Ecological Impacts of Climate Change [CEICC], 2012). All of these distort the harmony of ecosystem on which much of human health and prosperity depend (European Commission, 2014). In consequences, these events have begun to widen the scope of diseases, while paving way for the emergence of new traits of infections (Ugwu, 2018). For instance, bird flu, cholera, Ebola, plague, asthma, tuberculosis, malaria among others are just a few of the diseases likely to spread and get worse as a result of CC (Biello, 2008; Fritz and Samenow, 2014). Furthermore, the changes will lead to crop failure, food shortage, hunger, increased natural disasters, displacement, injuries and deaths (Physicians for Social Responsibility [PSR], 2014; Ugwu, 2018; CEICC, 2012). There has been public outcry about climate change ever since the idea was first put forward (Haldar, 2011). It was for this that the World Health Organization (WHO, 2014) has described CC as an emerging and significant threat to public health. This created the urgent need to trace the cause of the menace.

Scientists have spent time to figure out the major cause(s) of CC. It was found that although natural processes have an insignificant contribution to climate change, emissions from human activities which have risen since industrial revolution have been shown to be chief drivers of the changing climate (Intergovernmental Panel on Climate Change [IPCC], 2014). Since industrial revolution, humans has kept on adopting new ways of living which result to generation of greenhouse gases in unprecedented quantities. For instance, there are more new vehicles on the road every day. The use of fume producing machines like motorcycle, generators among others has increased. Energy use has also increased due to heating, cooling and other activities. There are also increase in various mechanized industrial and agricultural activities which release substantial amount of carbon into the atmosphere. Humans have gotten used to all of these new technologies to carry out their daily tasks. These activities generate copious quantities of greenhouse gases which are responsible for the changing climate. Therefore, so long as humans continue to depend on burning of fossil for their various activities, climate change would go on to increase in its intensity.

In view of the foregoing, what is urgently needed to reverse this trend is mass action for reduction of global emission, and a plan on how to adapt to changes already caused. However, more often than not, most people do not seem to understand or believe in climate change (Ugwu, 2018). This is because unlike other social problems like war, kidnapping or terrorism that are more visible and evoke visceral reaction, climate change is somewhat distant and imperceptible. So, people may not understand how their behaviours are connected to it. Therefore, when people decide on how much and what to consume, they may not likely take into account the impact of the wastes they produce on the environment. Even when such behaviours may damage the environment, they truly may not mean to do the damage; at most, they are accepting the environmental impact as a side effect of some particular behaviour (Kaiser, Doka, Hofstetter, & Ranney, 2003). Hence, people would need to understand what climate change is before they could voluntarily join in fighting it. Ugwu (2018) noted that knowledge about the causes and risks of CC is required for translating public concern for it into effective every-day actions. Moreover, until people understand CC, they may not support regulation against it or help to reduce greenhouse gas production (Ugwu, 2018). This is why capacity building (programmes that enhance knowledge of climate change among the public) has been central in most international conventions on climate change as one of the strongest tool for fighting the

menace. One of the best ways of spreading climate change information among the public is through influential members of the society like the teachers.

The roles of teachers in the society are significant, valuable and complex. Teachers are constantly being watched and viewed in the society as motivators, guides, heroes, surrogate parents, mentors, and leaders who thrive to make the world a better place (Hana, 2014). The implication of this is that people will more likely assimilate every information which teachers would present on climate change than those gotten from other sources. This is because teachers are seen as models and are often admired by both the students and members of the general society (Adenusa, 2015). In this sense, whatever a teacher says or does, the students and society would perceive it as normal and therefore may be likely emulated. This makes teachers greatest assets for fighting climate change. However, this is only possible if the teachers have adequate knowledge of and proper attitude to climate change.

Studies that focused on teachers' knowledge and attitude towards CC are well documented. Kehinde, Olatunji and Yetunde (2006) conducted a study to determine the knowledge of and attitude towards climate change among secondary school teachers in Ondo State. The findings revealed that the female teachers had lower knowledge but better attitude towards climate change. The urban teachers had higher knowledge better attitude towards CC. Their study was silent on the general level of knowledge of CC among the teachers. Similarly, Ekpoh and Ekpoh (2011) conducted a similar study in Calabar Municipality and found that the level of CC awareness among secondary school teachers in Calabar was low. The male teachers had higher mean awareness of CC than their female counterparts. In another related study conducted in Nova Scotia by Baker and Loxton (2013), it was found that teachers held many misconceptions about CC. The majority of teachers showed positive attitude to CC. Furthermore, Ochieng and Koske (2013) investigated the level of CC awareness and perception among primary school teachers in Kisumu Municipality, Kenya and found that the level of CC awareness among primary school teachers is low, and they had positive attitude to CC. Finally, Sadik and Sadik (2014) conducted a study to investigate knowledge and attitudes of teacher candidates towards environment in University of Cukurova. It was found that student teachers have a moderate level of environmental knowledge and more positive attitude towards environment but low level environmental behaviours.

Most of the previous studies from across the globe reveal that teachers hold extensive gaps in CC knowledge and attitude. Few studies which was carried out in Nigeria on the subject (Aladag & Ugurlu, 2011; Nwankwo & Unachukwu, 2012) produced similar findings. However, majority of these studies are becoming outdated. The recent happenings across the globe like the outbreaks of pandemic, war, terrorism, kidnaping among others seems to have diverted people's attention away from CC because they are more visible and evoke strong emotional reaction. In consequence, majority of studies in public health have been diverted to these social issues. Regrettably studies measuring teachers' knowledge and attitude towards climate change are becoming scarce. Most of the available findings are somewhat stale and may not represent the current status of teachers the on the subject. Hence, there is the need for current research on the subject. Therefore, this study was carried out to assess the CC knowledge and attitude of the secondary school teachers in Enugu State, Nigeria.

Purpose of the Study

The purpose of this study was to identify the level of CC knowledge and attitudes, possessed by secondary school teachers in Enugu state. In addressing this purpose, the study sought to answer the following research questions:

1. What is the level of knowledge of CC among secondary school teachers in Enugu state?
2. What is the attitude towards CC among secondary school teachers in Enugu state?

Hypotheses

The following null hypotheses were postulated to guide the present study. Each of them was tested at 0.05 level of significance and at appropriate degrees of freedom.

1. There is no significant difference in the level of knowledge of CC among secondary school teachers in Enugu state based on gender.
2. There is no significant difference in the level of knowledge of CC among secondary school teachers in Enugu state based on location.
3. There is no significant difference in the teachers' attitude towards CC based on gender.
4. There is no significant difference in the teachers' attitude towards CC based on location.

Methods

This study adopted cross-sectional research design in assessing the level of CC knowledge and attitude among secondary teachers in Enugu State. The population for the study consisted of all the secondary school teachers in Enugu State. The sample for this study consisted of 384 teachers drawn through multistage sampling technique from the six education zones in the State. This sample size is in line with the work of Cohen, Manion and Morrison (2011) which stipulated that when the population of the study is up to 8909 at 95 per cent confidence level within 5 per cent marginal error, 368 and above will constitute the sample.

A 38-item Teachers' Climate Change Knowledge and Attitude Questionnaire was the instrument used for data collection. The questionnaire has four sections namely: A, B, C and D. Section A contained two items (1-2) which were meant to elicit information on the Teachers' socio-demographic background namely: gender and location. Section B had 17 items (3-20) with multiple choice options which were posed to ascertain the level of teachers' knowledge of climate change. Section C had 18 items (21-38) which were used to elicit information on teachers' attitude to CC. Likert-type scale was used in this section. The scale included: Strongly Agree, Agree, Disagree and Strongly Disagree. The respondents were to tick in any of the options to indicate their attitude concerning climate change.

Five experts drawn from the Department of Human Kinetics and Health Education, University of Nigeria, Nsukka validated the instrument. Split half method was used to determine the reliability of the instrument, using Spearman Brown Correction Formula for CC knowledge scale which yielded reliability of .72; and Crombach Alpha for CC attitude scale which yielded reliability of .76

There was high return rate (100%) as the copies of questionnaire were collected on the spot of administration. The completed copies were coded into IBM SPSS version 11.0. Frequency, percentage, mean and standard deviation were used to analyze research questions while Chi-square,

t-test, and One Way ANOVA were used to test the hypotheses the null hypotheses at .05 level of significance and at appropriate degrees of freedom.

Results

Research Question Two

What is teachers' level of knowledge of climate change?

Table 1

Level of CC knowledge Possessed Teachers (n=335).

S/N	Items	Correct		Incorrect	
		f	%	f	%
4.	Meaning of climate change- A long change in the world weather patterns which distorts the harmony of ecosystem.	172	51.3	163	48.7
5.	Mechanism of climate change- gases accumulate in the Earth's atmosphere making the global temperature to rise.	172	51.3	163	48.7
6.	Term closely and consistently associated with climate- Global warming.	206	61.5	129	38.5
7.	Gases known to be responsible for climate change- Green house gases.	225	67.2	110	32.8
8.	Gas that does NOT cause climate change- Oxygen.	184	54.9	151	45.1
9.	Human mobility patterns that can contribute to climate change- Vehicular transport, motorcycle riding, engine-driven Canoe/ boat, aircraft, and railway transport.	155	46.3	180	53.7
10.	Agricultural practices can contribute to climate change- Application of agro-chemicals (fertilizers, herbicides etc), mechanization, and bush burning.	188	56.1	147	43.9
11.	Activities at home that can contribute to climate change- burning of old materials like clothes, shoes among others.	221	66.0	114	34.0
12.	Which of the following is not direct effect of climate change on the environment- Drop in the global temperature.	153	45.7	182	54.3
13.	Which of the following is not direct effect of climate change on food production- A more welcoming environment for survival of more plant and animals.	128	38.2	207	61.8
14.	Which of the following is not direct effect of climate change on human health- None of the above.	150	44.8	185	55.2
15.	Technical term used in describing conscious efforts for prevention of climate change - Climate change mitigation.	169	50.4	166	49.6
16.	To slow down climate change we should not –drive cars, burn materials or often put on generators.	102	30.4	233	69.6
17.	Which of the following is not technological method of emission reduction- Garbage incineration.	169	50.4	166	49.6
18.	Green behaviour means- leading environmentally friendly life.	154	46.0	181	54.0
19.	Which of the following is not a conference held for solution to climate change-Congo conference.	166	49.6	169	50.4
20.	Managing or coping with climate change is- Adaptation to climate change.	192	57.3	143	42.7
21.	In order to cope with or contain the effects of climate change we must- None of the above.	128	38.2	207	61.8
% Average		50.3		49.7	

Key: Below 21%- Very low knowledge; 21-39%- Low knowledge; 40-59%- Moderate knowledge; 60-79%- High knowledge; 80% and above- Very high knowledge.

Table 1 reveals that overall, teachers possessed moderate knowledge of climate change (50.3 %). Specifically, the greatest proportion of teachers know: that climate change is caused by greenhouse gases (67%); that some domestic activities like burning of old materials including clothes, shoes among others contribute to climate change (66.0%); that global warming is a term closely and consistently associated with climate change (61.5%); that managing or coping with climate change refers to adaptation to climate change (57.3%); that application of agro-chemicals (fertilizers, herbicides etc), mechanization, and bush

burning are some of the agricultural practices can contribute to climate change (56.1); and that the gas that does not cause climate change is oxygen (54.9).

Research Question Two

What is the teachers' attitude towards climate change?

Table 2

Mean Analysis of Teachers' Attitude towards Climate Change (n=335).

S/N	Item	\bar{x}	SD	Decision
22.	No one can claim to know the cause of climate change.	1.61	.75	NEG
23.	It is not important knowing the cause of climate change.	1.74	.81	NEG
24.	All the claims made about causes of climate change are not true.	1.67	.83	NEG
25.	Climate change has been existing. It is not caused by anything or anyone.	1.63	.83	NEG
26.	Human activities are the significant causes of climate change.	2.07	1.01	NEG
27.	My actions alone have no impact on the global climate.	1.91	.99	NEG
28.	Climate change is the greatest environmental issue of our time with a lot of health consequences.	2.41	1.06	NEG
29.	Climate change will lead to crop failure, food short and hunger.	2.12	.84	NEG
30.	Climate change will lead to extinction of many animal and plant species.	2.09	.96	NEG
31.	Displacement, natural disasters, heat stress, drought and flood are all effects of climate change.	2.29	1.05	NEG
32.	Nigeria will not be affected by climate change.	2.08	.97	NEG
33.	The effects of climate change are exaggerated to scare people.	1.82	.91	NEG
34.	It is too late to tackle the issue of climate change.	1.99	1.03	NEG
35.	Solution to climate change is for the government not individuals.	2.08	1.04	NEG
36.	I am ready to accept some level of inconveniences in order to reduce my per capita emission.	2.67	1.02	POS
37.	My actions to reduce the effects of climate change as a teacher in my community will encourage others.	2.41	1.07	NEG
38.	I am ready to carry out government policies or join voluntary group to fight climate change.	2.65	1.04	POS
39.	I will only join the fight against climate unless everyone else has done so	1.79	1.02	NEG
Grand \bar{x}		2.06	0.96	NACC

Key: NEG- Negative attitude to climate change; POS- Positive attitude to climate change

Table 2 reveals that on the whole, teachers possessed negative attitude towards climate change (Grand $\bar{x} = 2.06 < 2.5$, $SD = 0.96$). Particularly, the teachers had negative attitude towards climate change by disagreeing: that there is known cause(s) of climate change ($\bar{x} = 1.61$, $SD = .75$); that climate change has not been existing but caused by human activities ($\bar{x} = 1.63$, $SD = .83$); that all the claims made about causes of climate change are true ($\bar{x} = 1.67$, $SD = .83$); that Nigeria will be affected by climate change ($\bar{x} = 2.08$, $SD = .97$); and that the effects of climate change are exaggerated to scare people ($\bar{x} = 1.82$; $SD = .91$). Finally, they possessed negative attitude towards climate change by: agreeing that it is too late to tackle the issue of climate change ($\bar{x} = 1.99$; $SD = 1.03$); and by being unwilling to accept some level of inconveniences in order to reduce their per capita emission ($\bar{x} = 2.67$; $SD = 1.02$).

Hypothesis One

There is no significant difference in the level of knowledge of CC among secondary school teachers in Enugu state based on gender.

Table 3

Summary of Chi-Square Analysis of No Significant Difference in the Level of Knowledge of CC among Secondary School Teachers in Enugu state based on Gender. (n=335).

Variable	N	Correct O (E)	Incorrect O (E)	X ² -val	df	P. value
Gender						
Male Teachers	146	129 (115.5)	17 (30.5)			
Female Teachers	189	136 (149.5)	53 (39.5)	13.40	1	.000*

Key: O = Observed frequency; E = Expected frequency; * Significant at P<0.05

Table 3 shows the result of Chi-square analysis of no significant difference in teachers' knowledge of climate change according to gender. The result indicates that there is a significant difference in teachers' knowledge of climate change according to gender ($\chi^2 = 13.40$, $df = 1$, P-value = $.000 < .05$). This implies that teachers differ significantly in their knowledge of climate change according to gender.

Hypothesis Two

There is no significant difference in the level of knowledge of CC among secondary school teachers in Enugu state based on location.

Table 4

Summary of Chi-Square Analysis of No Significant Difference in the Level of Knowledge of CC among Secondary School Teachers in Enugu state based on Location. (n=335).

Variable	N	Correct O (E)	Incorrect O (E)	X ² -val	df	P. value
Location						
Rural Teachers	143	95 (113.1)	48 (29.9)			
Urban Teachers	192	170 (151.9)	170 (151.9)	24.24	1	.000

Table 4 above shows the result of Chi-square analysis of no significant difference in teachers' knowledge of climate change according to location. The result in the above Table indicated that there is a significant difference in teachers' knowledge of climate change according to location ($\chi^2 = 24.24$, $df = 1$, P-value = $.000 < .05$). This implies that teachers differ significantly in their knowledge of climate change according to location.

Hypothesis Three

There is no significant difference in teachers' attitude towards climate change based on gender.

Table 5

Summary of *t*-test of No Significant Difference in Teachers' Attitude towards Climate Change based on Gender (n=335).

Variable	N	\bar{x}	SD	Standard Error Mean	t	df	95% CI	P-value
Gender								
Male	146	35.29	5.37	.444	-4.151	325.909	-4.518-1.613	.000
Female	189	38.36	8.11	.590				

Table 5 indicates that there was significant difference in the mean scores for male teachers (\bar{x} =35.29, SD= 5.37) and female teachers (\bar{x} =38.36, SD= 8.11) at $P < .05$ ($t = -4.151$; $P = .000 < .05$). This implies that male and female teachers significantly differ in their attitudes towards climate change.

Hypothesis Four

There is no significant difference in teachers' attitude towards climate change based on location.

Table 6

Summary of *t*-test of No Significant Difference in Teachers' Attitude towards Climate Change based on Location (n=335).

Variable	N	\bar{x}	SD	Standard Error Mean	t	df	95% CI	P-value
Location								
Rural School	143	36.19	5.84	.488	-1.924	332.84	-2.95-.033	.055
Urban School	192	37.65	8.02	.579				

Table 6 shows that there was no significant difference in the mean scores for rural teachers (\bar{x} =36.19, SD= 5.84) and urban teachers (\bar{x} =37.65, SD=8.02) at $P < .05$ ($t = -1.924$; $P = .055$). This implies that rural and urban teachers did not differ in their attitudes towards climate change as the magnitude of differences in the means of the two groups (mean difference= -1.46, 95% CI:-2.95-.033) was very small.

Discussions of the Findings.

The result of the study showed that the teachers had moderate knowledge of climate change. This finding was not expected, therefore, surprising in view of the fact that educated individuals should know about environmental problems (Ikeme, 2001). The finding is supported by Ochieng and Koske (2013) who found that the level of climate change knowledge among teachers is not significantly low, but there exist significant gaps in their knowledge implying that teachers possessed moderate level of climate change knowledge. Sadik and Sadik (2014) also found that student teachers

had a moderate level environmental knowledge. However, the finding of the present study is in contrast with the reports of similar previous studies by Ekpoh and Ekpoh (2011), Nwankwo and Unachukwu (2012) and Baker and Loxton (2013) who reported low level of knowledge among their teachers.

Regarding the effect of gender on the teachers' knowledge found a significant difference in teachers' knowledge of climate change according to gender ($x^2 = 13.40$, $df = 1$, $P\text{-value} = .000 < .05$). This finding contrasts that of Ekpoh and Ekpoh (2011) who reported that there was a significant difference in the knowledge of climate change between male and female teachers as the male teachers have higher mean awareness of climate change than their female counterparts. Ochieng and Koske (2013) also identified a significant difference between the males (67%) and females (31%) with respect to their knowledge of climate change. The reason for the contrast in the two studies may be attributed to the fact that they were conducted in different location.

The result in Table 4 indicated that a significant difference exists in teachers' knowledge of climate change according to gender ($x^2 = 24.24$, $df = 1$, $P\text{-value} = .000 < .05$). This implies that teachers differed significantly in their knowledge of climate change according to gender. However, Ali and Sinha (2012) reported that respondents in urban areas possessed higher environmental awareness than those in semi-urbanized rural areas. Also, Ochieng and Koske (2013) found that respondents in the urban area were more aware of climate change ($x = 74.50$, $SD = 10.98$) compared to their counterparts from the peri-urban schools ($X = 70.42$, $SD = 12.11$).

Table 2 revealed that teachers had negative attitude towards climate change (Grand $\bar{x} = 2.06 < 2.5$, $SD = 0.96$). This finding was not expected, therefore, surprising. As learned members of the society, teachers should have positive attitude to climate change. This finding conflicts with that of Ochieng and Koske (2013) who found that teachers in Kisumu Municipality perceive climate change as a threat. Finally, Ugwu (2018) reported that teachers showed positive attitude to climate change as an overwhelming 93 per cent either agreed or strongly agreed with the statement that climate change is an issue of global.

A summary of *t*-test analysis in Table 5 showed significant difference in teachers' attitude towards climate change based on gender. This result is not expected and disagrees with previous findings. For instance, Kollumuss and Agyeman (2002) found a significant difference between women and men with respect to attitude towards environmental issues. The authors reported women usually were more emotionally engaged, showed more concern about environmental destruction and were more willing to change. O'Connor, Bord, Yarnal and Wiefek (2002) also reported that although women were more likely than men to think that climate change will occur, they were also more likely to believe that causes, such as pesticides, contribute to climate change.

The finding that there was no significant difference in teachers' attitude towards climate change based on location as shown in Table 6. This finding is not expected, therefore, surprising. As learned members of the society, teachers should have positive attitude to climate change. However, this finding did not agree with the previous finding of Mings and Jeffery (2008) who found that lesser percentage of rural respondents had positive attitude climate change compared to urban respondents.

Conclusion

This study found the secondary school teachers in Enugu State including male and female teachers, and urban and rural teachers possessed moderate knowledge of climate change. However, there was a significant difference in the teachers' knowledge of climate change based on gender, and on location. On the attitude towards climate change, it was found that all the teachers had negative attitude to CC. There was significant difference in teachers' attitude to CC based on gender but the difference based on location was not significant.

Recommendations

Based on the finding of the present study, the discussions, and conclusions thereof, the following recommendations were made:

1. The Enugu State Ministry of Education is encouraged to adopt the Climate Change Knowledge, Attitude and Mitigation Practices Enhancement Strategies State wide for inclusion and implementation in the secondary schools. This can be achieved through employing the train-the-trainers workshops by experts to train principals, health educators, counselors, psychologists and other stake holders in using these strategies in enhancing climate change KAP not necessarily for teachers only but also for the general public.
2. Climate change should be made a cross-disciplinary subject for schools and colleges as this will make the trainee teachers in colleges of education to be armed with sound climate change information even before they start practicing.
3. Furthermore, the Ministry of Education, international agencies and NGOs should always embark on creating climate change awareness to help in promoting teachers' KAP relating to climate change.

References

- Aaron M., & McCright, A. M. (2010). The effects of gender on climate change knowledge and concern in the American public. *Popul Environ* 32, 66–87.
- Adebola, S. (2010). *Climate Change Effects in Nigeria*. <http://iinitiative.wordpress.com/2010/03/30/climate-change-effects-in-nigeria/>.
- Adenusa, D. I (2015). *The teacher and the society*. <https://www.modernghana.com/newsthread/380958/283080#showcomments>
- Aladag, E. & Ugurlu, N. B. (2011). *Global climate change education in Turkey*. Retrieved December 4, 2011 from <http://www.herodot.net/conferences/Ayvalik/papers/educ-08.pdf>.
- Ali, R., & Sinha, B. (2012). *A study of environmental awareness and ecological behavior among female B.Ed. students*. Retrieved from http://www.edupublication.com/educational_perspective.
- Biello, D. (2008). *Deadly by the dozen: 12 diseases climate change may worsen*. <http://www.scientificamerican.com/article/twelve-diseases-climate-change-may-make-worse/>.
- Cohen, L., Manion, & Morrison, K. (2011). *Research method in education (7th ed.)*. New York: Routledge Taylor & Francis Group.

-
- Committee on Ecological Impacts of Climate Change-CEICC (2012). *Ecological impacts of climate change*.
- Ekpoh, U. I., & Ekpoh, I. J. (2011). Assessing the Level of Climate Change Awareness among Secondary School Teachers in Calabar Municipality, Nigeria: Implication for Management Effectiveness. *International Journal of Humanities and Social Science*, 1, 3.
- European Commission (2014). *Adaptation to climate change*. ec.europa.eu/clima/policies/adaptation.
- Fritz, A., & Samenow, J. (2014). *Will climate change worsen Ebola outbreaks?* <http://www.washingtonpost.com/blogs/capital-weather-gang/wp/2014/08/05/will-climate-change-worsen-ebola-outbreaks/>.
- Haldar, I. (2011). *Global warming: The causes and consequences*. Retrieved from <http://books.google.com.ng/books?id=2qR8Jdrd4EQC&pg>.
- Hana, K. (2014). *Teachers have to be role models*. Retrieved from <https://www.linkedin.com/pulse/20140426050345-53904040-teachers-have-to-be-role-models>.
- Intergovernmental Panel on Climate Change-IPCC (2007a). *Climate change 2007: Synthesis report*. New York: Cambridge University Press.
- Intergovernmental Panel on Climate Change-IPCC (2013). *The fifth assessment report (AR5)*. Retrieved from <http://www.ipcc.ch/>.
- International Knowledge Measurement, IKM, (2011). *Managing knowledge begins with measuring knowledge*. Retrieved November 21, 2011 from <http://www.ikmnet.com/>
- IPCC (2007b). *Climate change: The Physical Science basis – contribution of the Working Group I of the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change*. Cambridge and New York: Cambridge University Press.
- IPCC (2007c). *Summary for policymakers: Mitigation in the short and medium term (until 2030)*. The IPCC 4th Assessment Report of Working Group 3.
- Kaiser, F. G., & Gutscher, H. (2003). The proposition of general version of the theory of planned behaviour (TPB): predicting ecological behaviour. *Journal of Applied Social Psychology*, 33, 586-603.
- Kehinde, K. O., Olatunji, J. E., & Yetunde, B. (2006). *Knowledge of and attitude towards climate change*. Ibadan: Scholars Publications.
- Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8, 239-260.
- Mings, L., & Jeffery, H. (2008). *Determination of public knowledge, attitudes and practices on climate change issues in Antigua and Barbuda*. Retrieved from <http://gefantigua.org/wp-content/uploads/2010/Determination-of-Knowledge-Attitudes-and-Practices-on-Climate-Change-Issues-in-Antigua-and-Barbuda.pdf>.

-
- Nwankwo, C. A., & Unachukwu, G. O. (2012). Teachers awareness of the causes and effects of climate change and their classroom management strategies in climate change era. *Research Journal in Organizational Psychology & Educational Studies*, 1(3), 161-167.
- Ochieng, M. A., & Koske, J. (2013). Level of CC awareness and perception among primary school teachers in Kisumu Municipality, Kenya. *International Journal of Humanities and Social Science*, 3(21), 174-179.
- O'Connor, R. E., Bord, R. J., & Fisher, A. (1999). Risk perceptions, general environmental beliefs, and willingness to addressing climate change. *Risk Analysis*, 19, 461-471.
- Physicians for Social Responsibility-PSR (2014). *Climate change is a threat to health*. <http://www.psr.org/environment-and-health/climate-change/>.
- Sadik, F., & Sadik, S. (2014). A Study on Environmental Knowledge and Attitudes of Teacher Candidates. *Procedia- Social and Behavioral Sciences* 116. DOI:10.1016/j.sbspro.2014.01.577
- Ugwu, N. F. (2018). Climate change knowledge, attitude, mitigation practices and enhancement strategies for secondary school teachers in Enugu State. An unpublished PhD thesis, University of Nigeria, Nsukka.
- World Health Organization (2014). *Climate change and human health*. <http://www.who.int/global-change/en/>.